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#### (54) OPTICAL DISK, OPTICAL DISK DRIVE APPARATUS, AND OPTICAL DISK TRACKING METHOD

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#### (56) References Cited

#### U.S. PATENT DOCUMENTS

5,361,245 A 11/1994 Yoshida et al. 5,508,995 A 4/1996 Moriya et al. 5,508,996 A 4/1996 Endoh 5,537,373 A 7/1996 Horikiri

(List continued on next page.)

#### FOREIGN PATENT DOCUMENTS

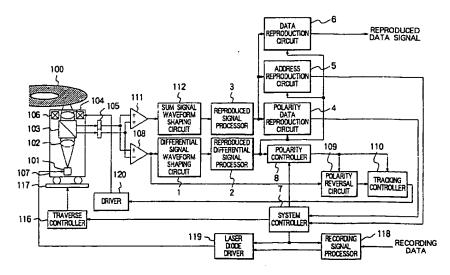
EP	628952	12/1994
EP	757343 A1	8/1996
EP	9740291	10/1996
GB	2307589	6/1997
JP	6459632	3/1964
JP	6357859	3/1982
JP	438633	2/1992
JP	696447	4/1994
JP	6176404	6/1994
JP	6274896	9/1994
JP	6 <b>2</b> 90465	10/1994
JP	6325368	11/1994
JP	750014	2/1995
JP	7057302	3/1995
JP	7110944	4/1995
JP	7141701	6/1995
JP	8022621	1/1996
JP	9106579	4/1997
JP	9282669 A	10/1997

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(57) ABSTRACT

The invention provides an optical disk medium having a recording spiral formed by connecting groove tracks and land tracks alternately, and permitting detection of a connecting point between a groove track and a land track reliably is provided, and a method of tracking the optical disk medium and an optical disk drive apparatus for driving the optical disk medium. One part of an identification signal area is shifted by a predetermined distance in one radial direction from the center of a groove, while another part of the identification signal area is shifted by the same distance in the opposite radial direction from the center of the groove. A land/groove polarity of a sector is determined by the polarity of a tracking error signal and the order of the polarities during reproduction of an identification signal.

### 4 Claims, 18 Drawing Sheets



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5,638,35 5,754,50 5,838,65 5,862,11: 5,867,47 5,892,74 5,933,39 5,933,41	A A A A A A A A A A A A A A A A A A A	6/1997 5/1998 11/1998 1/1999 2/1999 4/1999 8/1999	DOCUMENTS  Nakayama et al.  Nagasawa et al.  Nagai et al.  Nagasawa et al.  Nagasawa et al.  Yamashita et al.  Nakane et al.	5,946,285 A 8, 5,946,287 A • 8, 5,953,296 A • 9, 6,058,099 A 5, 6,064,643 A 5,	/1999 /1999 /1999 /2000 /2000	Nakane et al. Nakane et al. Nakyama et al
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